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ABSTRACT

This report describes a program designed to increase critical thinking skills in order to improve the transfer of material from the classroom to the clinic. The targeted population consisted of second year community college radiography students in a growing, middle class community in the Midwest. Evidence for the existence of the problem included clinical evaluation, anecdotal records, teacher observations, random testing/review of prior learned material and student self-assessments. Analysis of probable causes included the fact that students often memorize the material, there is no formal method to teach critical thinking in the curriculum, and emphasis placed on student performance in the clinic was primarily based on procedure performance. A review of solution strategies suggested by cited authors, combined with an analysis of the problem setting, resulted in the selection of two major categories of intervention: incorporate weekly reflective journal writing; and sharing and feedback from peers and instructor on entries. Post-intervention data indicated that clinical journal writing increased the student's self-esteem, resulted in better transfer of the material from the classroom to the clinic and improved the communication between the instructor and the student. In addition, it may have improved the critical thinking skills of the students; however additional strategies may be needed to cause a major effect. Appendixes contain a journal entry form, the student survey instrument, a journal checklist, a weekly performance evaluation form, and a post-intervention questionnaire. (Contains 23 references, 2 tables, and 1 figure). (Author/RS)

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IMPROVING CRITICAL THINKING SKILLS THROUGH REFLECTIVE CLINICAL JOURNALS

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Donna Collentine

An Action Research Project Submitted to the Graduate Faculty of the

School of Education in Partial Fulfillment of the

Requirements for the Degree of Master of Arts in Teaching and Leadership

Saint Xavier University & SkyLight

Field-Based Master's Program

Chicago, Illinois

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Analysis of probable causes included the fact that students often memorize the material, there is no formal method to teach critical thinking in the curriculum, and emphasis placed on student performance in the clinic was primarily based on procedure performance.

A review of solution strategies suggested by cited authors, combined with an analysis of the problem setting, resulted in the selection of two major categories of intervention: incorporate weekly reflective journal writing; and sharing and feedback from peers and instructor on entries.

Post-intervention data indicated that clinical journal writing increased the student's self-esteem, resulted in better transfer of the material from the classroom to the clinic and improved the communication between the instructor and the student. In addition, it may have improved the critical thinking skills of the students; however additional strategies may be needed to cause a major effect.

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CHAPTER 1

PROBLEM STATEMENT AND CONTEXT

Problem Statement

The students of the targeted radiologic technology class in a community college exhibited lack of critical thinking skills that interfered with the retention and transfer of the material between the classroom and the clinical setting. Evidence for the existence of the problem included clinical evaluations of the students, teacher observations, random testing/review of prior learned material, and student self-assessments.

Local Context

The community college identified had a yearly enrollment of over 6,000 credit students and over 34,000 non-credit continuing education students. The college provided Arts and Science transfer course work and approximately 30 Vocational/Technical programs.

The college was located in a large Midwestern community with a population of approximately 150,000. The college employed 422 individuals each semester, made up of 82 full-time and 32 part-time staff as well as 85 full-time and 223 adjunct faculty. The student demographic was 60% female, 12% minority, 60% Arts & Science transfer, 40% Vocational/Technical, a 50-50 split between full and part-time studies, an average

age of almost 27 years, with 50% of the student population qualifying for some form of federal financial aid.

The college had two divisions, Arts and Science transfer and Vocational/Technical programs. The radiologic technology program was located in the Vocational/Technical division, Allied Health department. The division was supervised by a dean, and the department had a coordinator. In addition, the program retained two full-time and several part-time instructors. It was a two-year program, with graduates receiving an associate of applied science degree in radiologic technology. The program admitted 20 students per year based upon admission criteria. Due to high student interest in this field, there was a 1-2 year wait for students to enter the program. The attrition rate for this program was 30%-40% and was based on several factors: poor academics, financial and personal barriers, and change of vocational interest. The program utilized four area hospitals as clinical affiliates for students who completed 1,600+ hours of clinical practicum upon graduation. The program had a 99% pass rate for the national board exam in the 25 years of existence. Students who graduated from this program went to work in hospitals, clinics, or offices. Some furthered their education in fields such as nuclear medicine, ultra sound, radiation therapy, computed tomography, and magnetic resonance imaging.

The college was the largest of three in this community college district, which served over 270,000 residents. The district had one chancellor and one governing board, but each college had their own president.

National Context

Allied health and nursing instructors have been increasingly concerned in the past several years with the lack of critical thinking (CT) skills displayed by students in these programs. Apparently, teachers need to incorporate critical thinking exercises into the curriculum just as they include the technical and vocational skills. One allied health profession, radiologic technology, is a highly technical and challenging profession that is rapidly changing. Thus, it is essential that radiologic technologists be proficient in the current knowledge and procedures necessary for effective patient care, but also they must be able to adapt to this rapidly changing profession. Critical thinking skills are necessary to carry these professionals into the next century.

Critical thinking is defined by Ennis (1985) as "reasonable and reflective thinking that is focused upon deciding what to believe or do" (p. 45). Miller and Babcock (1996) described critical thinking as "purposeful thinking that takes into consideration focus, language, frame of reference, attitudes, assumptions, evidence, reasoning, conclusions, implications, and context when they matter in deciding what to believe or do" (p. 8).

My concern is that students in the program have difficulty taking the information that they have learned in the classroom and creatively adapting it to an ever-changing clinical setting where each patient and situation is unique. It seems as though the classroom and the "real world" have little or no relationship from their viewpoint. Keyser and Broadbear (1999) articulated the pressing need to design health education to improve the thinking skills of students. In addition, the Joint Committee on National

Health Education Standards (1995) identified health-literate individuals as being critical thinkers and problem solvers.

If radiologic technology students are unable to transfer the classroom material to the clinical setting, the effects of this can range from subtle to dramatic. They may be able to function in a robotic manner, not truly understanding the full impact of their actions. This is known as functioning on "autopilot." The work gets done, but absent is the fulfillment that comes from the artistic aspect. In the opposite extreme, lack of critical thinking skills may cause them to be unable to compensate for differences in patient size, pathology, or technical changes that would impact the diagnostic quality of their work and ultimately the quality of patient care.

The profession of radiologic technology is defined as both a science and an art. The part of the profession that keeps the job interesting and exciting is the artistic aspect. The scientific aspects learned in the classroom that form the foundation of radiologic technology when applied creatively with critical thinking skills are the basis of a true "radiology professional."

CHAPTER 2

PROBLEM IDENTIFICATION

Problem Evidence

Concern about critical thinking at the targeted community college was evidenced by clinical evaluations of the students, teacher observations, random testing and review of prior learned material, and student self-assessments.

Data taken from two years of student clinical evaluations showed that many of the students were marked down in areas relating to the ability to solve problems and apply critical thinking because of failure to recognize the variations in the patient's condition, body size, mental state, or equipment available. These areas included: adapting to unusual situations, requiring assistance when performing X-ray procedures already learned, managing the procedures in an organized manner, interpreting directions, making sound decisions, and requesting clarification of instructions as needed.

Teacher observations while in the clinical setting noted that students were placing much importance on the actual positioning of the patient for the exam in order to get a good radiograph, yet were unaware of all of the subtle nuances going on around them. Discussions of clinical situations with the students showed that students would only give the facts of the incidents and not attempt to go to the next step of trying

to figure out how to better deal with such situations in the future. This would often leave the students frustrated and feeling as though they had no control over the situation.

During the two year program, students are tested at random on material from previous semesters. This material is chosen because it is deemed critical for the students to understand and know off of the top of their head in order to function in their job. Many students do quite poorly on these exams, primarily because they simply memorized the material for the class tests and did not understand it to the degree necessary in order to apply it to another situation at another time.

Students have identified this lack of critical thinking in themselves on their clinical self-assessments. When asked to identify their weakest areas in the clinical setting, common responses included inability to work alone, unsure of themselves, unable to transfer material learned in the classroom to the clinic and ability to respond and adapt to difficult and unusual situations.

Probable Causes

When searching for probable causes of this problem, this researcher felt that there were several factors that led to lack of critical thinking skills in students. In order to be good critical thinkers in the clinical setting, students must have a thorough understanding of the concepts involved, feel confident in their actions, be able to look beyond the immediate picture, and have the experience on which to base sound decisions.

Students tend to memorize the material for the test, get the grade, and move on. In this program, everything builds on material learned from prior semesters, so if the

students only memorize, they will have difficulty fully understanding the next concept. This is most likely a result of the education system where everything is focused on the grade or the test score. I will tell students that mistakes are the best teachers, when they miss a question on a test. This is because they often try to figure out why they missed it and end up understanding it much better than if they had guessed and gotten it right. Students need to be taught how to think, how to go through the steps it takes to arrive at a sound decision, and not just accept the end result. Each situation in the clinic is different from the next, and a good technologist will adapt and figure out the best way to handle each situation so that the doctor gets the best film while the patient gets the best care in the process.

In the two-year curriculum, there is no formal method of refection and feedback on student clinical experiences with instructors and peers. The students often informally discuss incidents that occur in the department and describe patient situations with each other and their instructors, but this researcher noticed that when such discussion did occur, only the facts of the incident would be discussed with little or no regard about doing things differently the next time a similar incident occurred.

Another factor contributing to this problem is that in the clinical setting, there is often little time for the technologist with whom the students are working to explain to the students their thought processes during a particular procedure. The students find themselves interpreting the technologist's actions in their own minds and their interpretations may be skewed.

The emphasis placed on student performance in the clinical setting is primarily

based on procedure performance, that is, their ability to get the radiograph. But there is much more to being a good technologist than just being able to get a good radiograph. With experience they will get good at this aspect of the job. The student needs to know how to adapt, change, process, and learn on an ongoing basis in order to stay on top of the ever-changing field, otherwise they will end up as "button-pushers," which may lead to boredom, stress, and eventually, job burnout.

The researcher noticed that some students were better at critical thinking skills than others. Radiology educators and professionals call these students "naturals." These students may not be the best in their class academically, but they display a lot of common sense. They tend to be thinking one step ahead at all times and can perceive a patient's, technologist's, or a doctor's needs, often without anyone asking. These students have no trouble adapting, changing, and growing. These students however, tend to be the exception. Most students are uncomfortable in the hospital setting in the beginning, oblivious to all that is going on around them, often unaware that there is a human being attached to the foot that they are trying to X-ray, unable to easily communicate with patients, physicians, and technologists. These skills come with time, but some technologists tend to fall into a problematic area where they function on "autopilot." This tends to work out for the most part as long as situations are not out of the ordinary. The problem with this is that the mind is not stimulated during the work day and ultimately technologists may become bored with their jobs. In addition, they may be completely at a loss when something out of the ordinary occurs and they are required to handle it. Major stress and panic may set in as they look for another's

assistance.

Numerous causes of lack of critical thinking skills in health education students have been documented. Paul (1995), a leader in the critical thinking movement, harshly criticized contemporary educational practices. He contended that educational approaches, such as emphasizing rote memorization, which he calls "the unending dominance of unimaginative didactic teaching" perpetuate an "anti-intellectual culture" (p 223). He believed, given the dramatic and inescapable change of the times and the propensity of the human mind and human systems to seek stasis, that "our educational institutions, unfortunately are totally unprepared" for the challenges that lie ahead and are "fixed on self-protection" (p 84).

Keyser and Broadbear (2000) stated that development of thinking skills, and of critical thinking skills in particular, is emerging as an important pedagogical approach for health instruction. Ubbes, Black and Ausherman (1999) described how critical thinking and creative thinking could enhance students' understanding of health concepts. Keyser and Broadbear (1999) articulated the pressing need to design health education to improve the thinking skills of students.

Teaching health education students to assess their own thinking could involve consideration of the developmental stage of the students. For example, when students initially are presented with critical thinking as a way to more deeply understand subject matter, they may not understand it. These students need distinct modeling of thinking skills and classroom activities that help them begin thinking about their thinking, as in metacognition. Too often teachers teach at their own levels of thinking or expect

students to rise to those levels quickly. Modeling, providing numerous practice opportunities, and recognizing real achievement in self-assessment of thinking can foster this practice in students over time (Elder & Paul, 1997).

When radiologic technology students lack the necessary critical thinking skills in the hospital setting, patient care suffers. Teaching the students how to critically think along with the importance of such thinking will benefit the students now and in their future. They will be more satisfied with their jobs and able to adapt to future changes within the profession.

CHAPTER 3

THE SOLUTION STRATEGY

Literature Review

A variety of critical thinking strategies have been developed and implemented by health educators throughout the United States. These strategies address the problem of how lack of critical thinking skills interferes with academic and clinical success of students in health education courses.

Portfolios can be used to assess students' performance. By reflecting on their collection of work, students may better understand their own thinking. The use of portfolios gives the students opportunities to reflect on their work metacognitively (Burke, 1999). The procedure of metacognition, which means thinking about one's thinking, helps students to become more empowered in their own learning and to be more self-reflective. Personal reflection required in the portfolio evaluation process increases the students' understanding of the processes and products of learning as they apply to their professional situations. Portfolios offer a link between learning and assessment that can affect both curriculum and instructional practice. Teachers increase their own awareness of how students learn while students become thoughtful evaluators of their own work (Stone, 1992).

The use of portfolios in higher education is on the increase across the country,

with about two-thirds of the colleges and universities in the United States using student portfolios for educational assessment. A portfolio contains samples of a student's work which can be evaluated to show growth over time. Students should be active participants in both the selection of work to be included and in self-reflection on their growth and development (Arter, 1992). A portfolio not only serves as a product which reflects student accomplishments, but also is a process during which students make decisions about which samples of their work to include (Cole, Messner, Swonigan & Tillman, 1991).

Another approach to increase critical thinking skills of health care workers is the use of case studies. The case study design encourages students to work through problem situations, generate hypotheses, and test these against relevant literature and personal experiences (Jones & Sheridan, 1999). The case study method is one approach to develop competencies with real or hypothetical situations. Learners examine all dimensions of a situation and are responsible for answering the questions or dilemmas posed. Case studies provide the opportunity for students to make decisions outside of the actual clinical situation. This affords a safe environment in which the students have time for reflection and analysis. The case study method promotes critical thinking skills including examining assumptions, identifying and weighing options for care, and setting priorities (Brookfield, 1993).

Another strategy to improve critical thinking skills is the use of journals. Journals provide an opportunity for the students to reflect on and share the actual experience, allowing the uniqueness of each experience to validate prior knowledge and new

learning (Patton, Woods, & Agarenzo, 1997). Callister (1993) stated that journal writing provides a means for students to further critical thinking skills by establishing fundamental linkages between classroom theory and clinical practice. The recording of students' experiences in a daily or weekly journal enables them to observe themselves responding, to reflect on their responses, and to critique their responses in an ongoing way.

Brown and Sorrell (1993) suggested that writing in clinical journals is a common assignment in practicums at all levels of nursing education. Brown and Sorrell suggested the concept of careful structuring of assignments for the clinical journal, rather than a free-response format. Clear expectations tend to validate the exercise, provide parameters for faculty response, and reduce both student and faculty time commitments. Journals provide an excellent opportunity for students to make sense of and to learn from their mistakes (Heinrich, 1992). In situations where direct observation of student performance is unrealistic, journal writing can offer an alternative means to evaluate student understanding of the theoretical and scientific basis for decision making, as well as validate their judgements in the clinical setting. Lastly, journals can be effectively used to create a "culture of inquiry" that will suit students well throughout their professional lives by enabling them to create new roles and to see beyond the obvious (Lieberman, 1995).

Implementing the use of Socratic questioning is another strategy to improve critical thinking among students. This teaching practice has been effective in fostering the development of thinking skills. Socratic questioning is designed to facilitate the

process of students discovering answers to their own questions. Faculty input into the discussion should be primarily questions that guide students to thinking in different ways to discover their own answers. Faculty offer clues to stimulate discussion, providing actual answers only when all else fails (Abegglen & Conger, 1997). Different types of questioning such as redirection, probing, reinforcement, and higher order questioning are known to increase students' content knowledge and enhance the development of critical thinking and creative thinking skills (Cotton, 1998).

Another theme that emerged in the literature is a need to use collaborative or group learning situations more effectively. Collaboration among radiologic technologists in practice is frequently a desired goal and, therefore, should be applied in education. If students are to become skilled in working collaboratively with others, they must have the experience doing so in the educational setting. In a complex patient care situation, the technologist would seek help from a colleague. If collaboration is an expectation in practice, the educational experience should provide opportunities to develop needed abilities in similar situations (Videbeck, 1997).

Project Objectives and Processes

Taking into account the many strategies from which to design an effective plan of action to promote critical thinking among radiography students, this researcher decided to incorporate weekly reflective clinical journal writing. The teacher would instruct the students on critical thinking, hold classroom discussions on journal entries and give individual feedback to students on their journals.

As a result of using metacognitive strategies through student journal writing

during the period from September 2001 through December 2001, the targeted radiography students will increase their application of critical thinking skills in the clinical setting as measured by clinical evaluations, critical thinking assessment tools, and instructor observation. In order to accomplish this objective, the following processes are necessary:

1. Design a student self-assessment tool for critical thinking to be administered once in September and again in December.
2. Incorporate journal writing and discussion time of one hour per week for the entire 16 week semester.
3. Develop a one hour unit on introduction to critical thinking to be taught the first week in September.
4. Create a bound journal for each student with entry and assessment forms.

Project Action Plan

A. Week 1 - Data collection to evidence the problem
    1. Explain journal process, hand out journals with assessment.
    2. Have students sign consent form
    3. Conduct student survey (20 minutes)
    4. Tally results of student survey
    5. Administer Critical Thinking Assessment Test (45 minutes)
    6. Score results of CT assessment test
    7. Unit on introduction to CT (1 hour)
    8. Write weekly entry in implementation journal

B. Weeks 2-15 Intervention

The next phase of the implementation plan involved weekly clinical reflective

journals. The students were in the hospital on Monday, Tuesday and Wednesday of each week. On Thursday they wrote in their journals about their week. The researcher designed the forms used in the journal for reflection and assessment and bound these together for each student. The students were given 30 minutes to reflect and write on their experiences on their own. The next 30-45 minutes were spent on sharing some of the experiences with the class. Peers gave feedback along with the instructor. The journals were turned in and read by the instructor. The instructor read and assessed to what degree critical thinking skills were utilized by the student. Feedback was written by the instructor and the journal was returned to the student. The researcher wrote a weekly entry in implementation journal.

C. Week 16 - Post assessment

1. Conduct student surveys (20 minutes)
2. Tally results of student survey
3. Administer Critical Thinking Assessment Test (45 minutes)
4. Score results of CT assessment test
5. Tabulate journal assessments
6. Write weekly entry in implementation journal

Methods of Assessment

In order to assess the effects of clinical journal writing on critical thinking, a student survey, a critical thinking assessment test, clinical evaluations and journal assessments were used. The student survey and critical thinking assessment test were administered the first week of the semester (September) and again at the end of the

semester (December). The journal assessment form was filled out each week by the instructor in order to track the number of entries that included critical thinking skills. Weekly clinical evaluations were studied to see if there was an overall increase in the class percentages.

CHAPTER 4

PROJECT RESULTS

Historical Description of the Intervention

The objective of this project was to improve the critical thinking skills of the radiologic technology students through reflective clinical journals. Many students exhibited a lack of critical thinking skills that interfered with the retention and transfer of the material between the classroom and the clinical setting. Evidence for the existence of the problem included clinical evaluations of the students, teacher observations, random testing and review of prior learned material, and student self-assessments.

When searching for probable causes of this problem, this researcher felt that there were several factors that led to lack of critical thinking skills in students. These included the tendency to memorize the classroom material, not being taught to be critical thinkers, and too little time in the clinic for reflection of patient care situations. In order to be good critical thinkers in the clinical setting, students must have a thorough understanding of the concepts involved, feel confident in their actions, be able to look beyond the immediate picture, and have experience on which to base sound decisions.

In the two-year curriculum, there was no formal method of refection or feedback on student clinical experiences with instructors and peers. The students often informally discussed incidents that occurred in the department and described patient

situations with each other and their instructors, but this researcher noticed that when such discussion did occur, often only the facts of the incident were discussed with little or no regard about doing things differently the next time a similar incident occurred.

In the clinical setting there is often little time for the technologist with whom the students are working to provide feedback to the students about their thought processes during a particular procedure. This feedback was identified by the students and faculty as being beneficial to the learning process. The implementation of reflective journal writing with peer and instructor feedback was selected to effect the desired change.

During the first week of school, student permission letters were distributed, collected and documented. The researcher informed the targeted students about the objectives and goal of the project. In addition, the teacher-researcher lectured on the topic of critical thinking and its importance to the profession.

In order to assess the effects of clinical journal writing on critical thinking, several methods were utilized. During the first week of the semester and again at the end of the semester the students were surveyed on their views of critical thinking using a self-assessment tool and The California Critical Thinking Skills Assessment Test. The California Critical Thinking Skills Assessment Test was designed to measure the skills dimension of critical thinking. The results of these assessments were tallied and recorded. Throughout the semester, student clinical evaluations were studied, and the clinical journals were assessed weekly by the teacher-researcher for evidence of critical thinking.

During the second through the fifteenth weeks, the journal writing process was

implemented. The students were in the hospitals on Monday, Tuesday, and Wednesday of each week. On Thursday they wrote in their journals about their week. The researcher designed the forms used in the journal for reflection and assessment and bound these together for each student (See Appendix A). The students were given 30 minutes to reflect and write on their week's experiences. The students were asked to write on their most positive, negative, and interesting clinical experience for the week. In addition they were asked to set goals for the following week. The next 30-45 minutes were spent on sharing some of these experiences with the class. Peers gave feedback along with the instructor. The journals were turned in to the instructor who used a checklist to assess to what degree critical thinking skills were utilized by the student. Feedback was written by the instructor and the journal was returned. The researcher also wrote an entry in an implementation journal on how the overall process was going.

During the first few weeks, the researcher found that the students were generally writing on just the facts without much analysis and interpretation. In order to help the students to expand on their writing, a Critical Practice Audit was added during the fourth week to the journal writing in order to promote more reflection in the journals. This required the students to give more details about the incident which they were writing on. It reflecting on their week, it asked the student to make assumptions about a particular incident and to look at it from a different perspective. In addition, the researcher promoted the use of Socratic questioning for the clinical instructors to help the students reflect on their experiences in the hospital setting. Examples of higher order questions were given to all clinical instructors and they were advised to use these

when possible in the clinic.

Presentation and Analysis of Results

One way in which critical thinking was assessed was through a student survey (Appendix B). In the survey, the students assessed their own perceptions of critical thinking both prior to and immediately after the fourteen-week journal writing process. The survey consisted of seven questions dealing with the student's perception of critical thinking. The results are tabulated in Table 1. There did not seem to be a shift in the student perceptions from before to after the intervention.

Table 1

Percent of Student Responses on Surveys Prior to and After Intervention

Question	No	Pre/Post			Yes
	1	2	3	4	5
1. CT skills can be taught.	0/8	0/16	25/16	42/50	33/8
2. I am a good CT.	0/0	8/16	16/16	58/42	16/25
3. My CT skills can improve.	0/0	0/0	25/16	16/25	58/58
4. Good RT's are good CT.	0/0	0/0	0/0	8/33	90/64
5. Adapt to unusual situations?	0/0	0/0	16/0	50/58	33/42
6. Transfer material from classroom to clinic.	0/0	0/0	0/0	58/42	42/58
7. CT skills can make career more interesting.	0/0	0/0	0/0	25/25	75/75

N = 13

In order to assess the affects of clinical journal writing on critical thinking a weekly check-list (Appendix C) was used to tally the number of times critical thinking

skills were evident the student journals for the week. Evidence of cognitive skills such as interpretation, analysis, evaluation, inference, explanation and self-regulation were assessed. The data were compiled and are presented in Figure 1. The level of critical thinking found in the journals greatly increased after the fourth week when the critical practice audit was added. The end of semester measurement of critical thinking indicated a significant increase in the quantity and quality of the writings. This gain seems to be related to the repeated use of the audit tool during the semester.

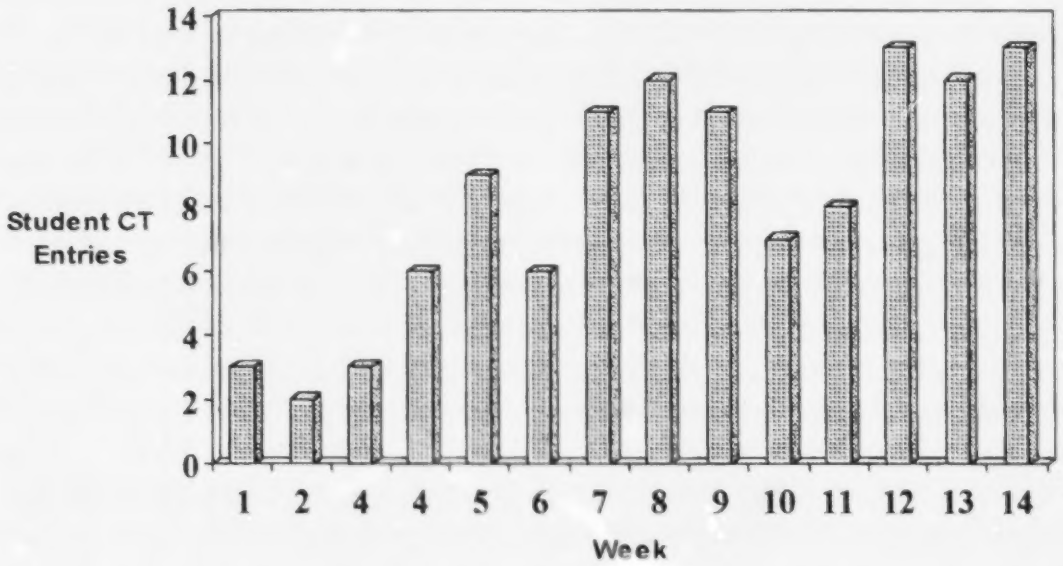

Figure 1. Utilization of critical thinking skills in the targeted radiologic technology student journals throughout the intervention period.

A critical thinking test was administered before and after the intervention to assess to what degree the journal writing process would affect the overall critical

thinking skills of the students. This test targeted critical thinking skills such as analysis, evaluation, inference, deductive and inductive reasoning. The results of this test are tabulated in Table 2. There was only a slight increase in the class average on the test. It is possible that the students were learning to critically think, but the posttest was administered too soon after the pretest for the change to be reflected in the scores. Another possible reason for the lack of score increase was the timing of the posttest. It was administered during finals week at the end of the semester and this may have led the students to not taking it too seriously as it was not part of any course grade. There was little incentive for them to perform their best.

Table 2
Results of California Critical Thinking Skills Assessment Test

	Pretest	Posttest	
Student	Total Correct	Total Correct	Difference
A	14	15	1
B	17	16	-1
C	17	18	1
D	15	16	1
E	16	14	-2
F	18	21	3
G	17	17	0
H	13	12	-1
I	14	16	2
J	17	17	0
K	17	18	1
L	17	15	-2
M	18	17	-1
Mean	16.15	16.3	0

N = 34

The student clinical evaluations (Appendix D) were compared throughout the journal writing process looking for a change in interpersonal competencies dealing with critical thinking skills. Data taken from two years of student clinical evaluations showed

that many of the students were marked down in the competencies relating to the ability to solve problems and use critical thinking because of failure to recognize the variations in the patient's condition, body size, mental state, or equipment available. These competencies included: adapting to unusual situations, requiring assistance when performing x-ray procedures already learned, managing the procedures in an organized manner, interpreting directions, making sound decisions, and requesting clarification of instructions as needed. As compared to the prior semesters, the overall scores in these areas did increase slightly.

Conclusions and Recommendations

Based on the presentation and analysis of the data on increasing critical thinking skills through reflective clinical journals, positive results were noted. These included increased self-esteem, increased professionalism, better understanding of the job, much insight for the instructor, and a direct line of communication between student and instructor.

Teaching critical thinking poses an important instructional challenge to the health education profession. Writing is one important method utilized in the development of critical thinking. It encourages the student to think in the abstract, to elaborate, generalize, and interpret. The cognitive skill of critical thinking is necessary for safe, effective health care. Students can determine what they really know and what they need to know in order to perform their job. Students need to be actively thinking at all times, not just passively accepting information.

The researcher found that the classroom discussions that followed the journal writing seemed to be enjoyed by all and the students tried to help each other with difficult situations in the clinic by giving ideas and offering possible solutions.

When the students were asked to evaluate the journal writing process at the end of the semester (Appendix E), they reported that they looked forward to writing in the journals each week and seeing what the instructor had responded to their last entry. The use of journals allowed the students to ask questions and share thoughts, which increased the dialog between the instructor and the student. "I liked the communication it brought between the student and teacher pertaining to things that happened in clinic," one student reported.

The students noted that in some ways it helped to put their experiences down on paper to help relieve the stress of the week. One student wrote, "It gave me a chance to get things off of my chest that were bothering me and to brag a little if something good happened."

The reflective aspect of the clinical experience integrated into the clinical journals was an area that was missing from the clinical practice. This practice helped to support the students' development of confidence, thoughtfulness and a process of self-initiated inquiry that will serve them professionally. Several student responses supported this.

- "Sometimes writing helped me to work out a problem I may have had and sometimes I would remember something that may have been important or that I had questions about, but with everything else going on I may have forgotten

about it if not for the journals."

- "I personally feel that by writing these things down it made me more aware and able to grow both mentally and emotionally."
- "I thought it was great that we could help each other as a whole group."
- "It helped me to really think through situations from beginning to end and how I could make the situation run more smoothly the next time."

The results of this study are limited to the sample group investigated. Although the sample size was small and the results of this research may not generalize to other schools, this project could provide other instructors with a method to add critical thinking into their curriculum. To fully investigate the relationship between journal writing and critical thinking, further research is recommended.

Finding ways to bridge the gap between the classroom theory and the clinical practice is of utmost importance and the use of journal writing is one way to help with this. The classroom and clinic can be bridged by challenging students to think through probing questions, testing assumptions and not spoon feeding solutions. Responsibility for learning is the learners.

> *"The student's motor is always running. The function of the educator is to place the signs, build the roads, direct the traffic and teach good driving habits, but not to drive the car!"* William Purkey

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Appendix A

Clinical Journal

Name Date

Clinical site Rotation

1. What was your most positive clinical experience this week?

2. What was your most negative clinical experience this week?

3. What was your most interesting clinical experience this week?

4. What goals would you set for next week?

5. Did you accomplish last weeks goals?

Appendix B

Name _____ Date_____

Critical Thinking Self-Assessment
Student Survey

Critical Thinking Defined:

- A process involving reasonable and reflective thinking that is focused upon deciding what to believe or do.
- Reflecting on the assumptions underlying our and others' ideas and action, and contemplating alternative ways of thinking and living.

		No				Yes
1.	Do you think critical thinking can be taught?	1	2	3	4	5
2.	Do you think you are a good critical thinker?	1	2	3	4	5
3.	Do you think your critical thinking skills can improve?	1	2	3	4	5
4.	Do you think that good technologists are good critical thinkers?	1	2	3	4	5
5.	Do you think that you can adapt to unusual patient care situations in the clinic?	1	2	3	4	5
6.	Do you think you can transfer the material learned in the classroom to the clinic?	1	2	3	4	5
7.	Do you think critical thinking skills can make your career more interesting?	1	2	3	4	5

Name:

Journal Entry Date:

Evaluation of Critical Thinking Skills Included in Journal Writing

Critical Thinking Cognitive Skills	Evidence	No Evidence
Interpretation- to comprehend and express the meaning or significance of a wide variety of experiences, situations, data, events, judgements, conventions, beliefs, rules, procedures or criteria. Includes categorization, decoding sentences, and clarifying meaning.		
Analysis - to identify the intended and actual inferential relationships among statements, questions, concepts, descriptions, or other forms of representation intended to express belief, judgement experiences, reasons, information or opinions. Includes examining ideas, identifying arguments, and analyzing arguments.		
Evaluation - To assess the credibility of statements or other representations which are accounts or descriptions of a person's perception, experience, situation, judgement, belief, or opinion; and to assess the logical strength of the actual or intended inferential relationships among statements, descriptions, questions or other forms of representation. Includes assessing claims and arguments.		
Inference - To identify and secure elements needed to draw reasonable conclusions; to form conjectures and hypotheses; to consider relevant information and to educe the consequences flowing from data, statements, principles, evidence, judgements, beliefs, opinions, concepts, descriptions, questions or other forms of representation. Includes querying evidence, conjecturing alternatives, and drawing conclusions.		
Explanation - To state the results of one's reasoning; to justify that reasoning in terms of the evidential, conceptual, methodological, criteriological and contextual considerations upon which one's results were based; and to present one's reasoning in the form of cogent arguments. Includes stating results, justifying procedures, and presenting arguments.		
Self-regulation - Self-consciously to monitor one's cognitive activities, the elements used in the those activities, and the results educed, particularly by applying skills in analysis and evaluation to one's own inferential judgements with a view toward questioning, confirming, validation or correcting either one's reasoning or one's results. Includes self-examination and self-correction.		

Appendix C

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Appendix D

SCOTT COMMUNITY COLLEGE
RADIOLOGIC TECHNOLOGY PROGRAM
CLINICAL PERFORMANCE EVALUATION

Name _____ Date _____

This evaluation form will be filled out on each student in clinical practicum at mid-term and at the end of the semester. Each interpersonal competency below will be evaluated with input from any/all of the following sources: personal observations, clinical advisors, registered technologists, radiologists, supervisors and department administrators.

(5) STRONGLY AGREE - exceeds expectations, outstanding performance for level of experience
(4) AGREE - meets expectations, satisfactory performance for level of experience
(3) NEEDS IMPROVEMENT - below expectations for level of experience
(2) DISAGREE - unacceptable performance for level of experience
(1) NOT APPLICABLE
If you choose "2" or "3", please indicate why in the comment section.

Grading Scale:
A = 166-180
B = 152-165
C = 144-151
Fail = below 144

INTERPERSONAL COMPETENCIES - AS PART OF THE CLINICAL EXPERIENCE, THE STUDENT WILL:

	I. MOTIVATION:
1 2 3 4 5	1. Show interest in learning new procedures and improving those previously learned.
1 2 3 4 5	2. Practice previously learned skills voluntarily.
1 2 3 4 5	3. Be self motivated and look for things to do.
1 2 3 4 5	4. Display initiative in gaining clinical competencies. (as appropriate per semester)
	II. ATTITUDE:
1 2 3 4 5	5. Accept guidance, suggestions and constructive criticism positively, and benefit as a result.
1 2 3 4 5	6. Maintain composure and professional decorum in all situations.
1 2 3 4 5	7. Exhibit pleasant, amiable behavior toward patients and personnel.
	III. COMMUNICATION SKILLS:
1 2 3 4 5	8. Exercise good judgement in the selection of topics for discussion.
1 2 3 4 5	9. Communicate effectively with patients and personnel.
1 2 3 4 5	10. Take patient history, record and convey messages or pertinent patient information to others.
1 2 3 4 5	11. Use appropriate medical terminology when necessary.
	IV. PATIENT CARE:
1 2 3 4 5	12. Consistently utilize universal precautions.
1 2 3 4 5	13. Perceive and respond to patient's needs. (i.e. washcloth, emesis basin, safety, modesty)
1 2 3 4 5	14. Recognize and respond to patient apprehensions.

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Appendix D

V. PROCEDURE PERFORMANCE:

1 2 3 4 5 15. Perform procedures accurately and relative to experience.
1 2 3 4 5 16. Require little assistance when performing exams already learned.
1 2 3 4 5 17. Practice radiation protection for patient and personnel.

VI. ORGANIZATION:

1 2 3 4 5 18. Manage procedures in an organized manner.
1 2 3 4 5 19. Assure that the room, equipment and supplies are maintained.
1 2 3 4 5 20. Perform exams ordered according to department routine.

VII. ABILITY TO FOLLOW DIRECTIONS:

1 2 3 4 5 21. Complete tasks as instructed.
1 2 3 4 5 22. Interpret directions and make sound descisions.
1 2 3 4 5 23. Request clarification of instructions as needed.

VII. PROFESSIONAL DEMEANOR:

1 2 3 4 5 24. Project a sense of confidence during the performance of radiologic procedures.
1 2 3 4 5 25. Recognize and acknoweledge limitations of knowledge and experience.
1 2 3 4 5 26. Exhibit behavior in accordance with professional code of ethics and clinical manual.

IX. APPEARANCE:

1 2 3 4 5 27. Follow dress code.
1 2 3 4 5 28. Practice good personal hygiene.

X. DEPENDABILITY:

1 2 3 4 5 29. Display interest in being involved in any exam, no matter how difficult or unpleasant.
1 2 3 4 5 30. Function in a reliable manner.

XI. ACCOUNTABILITY:

1 2 3 4 5 31. Assume responsibility for completing assignments promptly, thoroughly, and accurately.
1 2 3 4 5 32. Prepare room for the days procedures. (stock, warm-up)
1 2 3 4 5 33. Be present and aware of exams in assigned area.
1 2 3 4 5 34. Accept responsibility for own actions.

XII. INTEREST AND PREPARATION:

1 2 3 4 5 35. Demonstrate adequate preparation for assigned clinical rotations.
1 2 3 4 5 36. Be familiar with routine procedures in assigned area as outlined procedure manual.

COMMENTS:

Evaluator's Signature _____ Date _____

Appendix E

Did you enjoy the journal writing?

If so, what did you enjoy about it? If not, why?

Do you think it was beneficial to your clinical learning in any way? If so, how?

Would you recommend it for future classes?

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